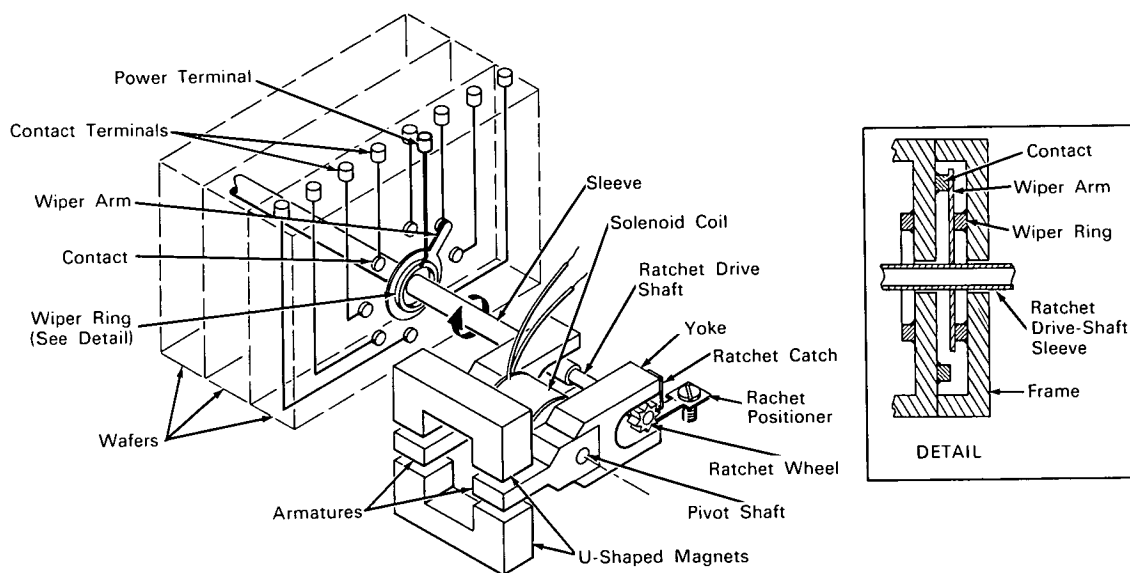


# NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

## Stepping Switch with Simple Actuator Provides Many Contacts in Small Space



**The problem:** To reduce the space required for a stepping switch with many contacts.

**The solution:** A compact assembly that incorporates a simple electromechanical actuator and a maximum number of wiper contacts.

**How it's done:** The actuator, housed in one section of the device, includes two U-shaped magnets with a gap between each pair of facing poles. Two armatures of magnetic steel (one armature on each end of the actuator housing) are positioned in the gaps between the pole pieces. These armatures are rigidly mounted on nonmagnetic yokes which are connected by means of a small pivot shaft of magnetic steel that extends

through the center of a solenoid coil. A resilient ratchet catch is mounted on the upper portion of one of the yokes. When current pulses of proper polarity are applied to the leads of the coil, the armatures rise and the ratchet catch engages one tooth of a small ratchet wheel that is mounted on a ratchet drive shaft. As a result of this action, the ratchet drive shaft is rotated through an angle corresponding to the distance between two teeth on the ratchet wheel.

An electrically insulated sleeve-like extension on the ratchet drive shaft passes through central holes in a number of switch-contact wafers that are mounted in tandem. Positioned on the sleeve is an electrical wiping

(continued overleaf)

arm (or plate, if combinations of contacts are desired) for each wafer. Electrical power reaches the wiping arms through wiping rings connected to power supply terminals on the switch. The wiping arms provide the necessary interconnections between the switch-wafer contacts and the power inlets. The several contacts on each of the wafers are arranged in a circle around the sleeve extension on the ratchet drive shaft and are wired to terminals on the switch housing. In operation, a prescribed pulsing current through the solenoid coil advances the ratchet drive shaft one tooth at a time to provide specified sequential switching of the contacts on the wafers.

**Notes:**

1. Although no new principles are used in the design of this switch, it provides a small-sized unit that is inexpensive to fabricate. The basic design can be modified for high-speed operation, and sealing should be a comparatively simple matter.
2. For further information about this innovation inquiries may be directed to:

Technology Utilization Officer  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B63-10118

**Patent status:** NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Jack V. Miller  
(JPL-122)